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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/705,347
Filing Date: November 08, 2003
Appellant(s): LABELLE ET AL.

Michael Farjami
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 6, 2008 appealing from the Office action mailed November 19, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

The final rejection of November 19, 2007 was appealed on May 1, 2006. The rejection was affirmed by BPAI on March 16, 2007.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2005/0079696	COLOMBO	4-2005
6,265,260	ALERS et al.	7-2001
6,566,250	TU et al.	5-2003
2005/0019964	CHANG et al.	1-2005

6,090,210	BALLANCE et al.	7-2000
6,759,337	ARONOWITZ et al.	7-2004
2005/0019964	CHANG et al.	1-2005

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 21-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colombo (US 2005/0079696) in view of Alers et al. (US 6,265,260) or Tu et al. (US 6,566,250) as evidenced by Chang et al. (2004/0188240; [0040]) or Ballance et al. (US 6,090,210; col. 1, lines 32-35), or Aronowitz et al. (US 6,759,337; col. 2, lines 45-50) or Chang et al. (US 2005/0019964; [0041]).

Colombo (Fig.4; [0010] [0012] [0025] [0029] [0032]) teaches conventional process steps of forming a MOS FET on a substrate comprising: A high-k dielectric layer may be formed over the substrate. A gate electrode layer (such as polysilicon) may be thereon. The gate electrode layer and high-k dielectric layer may be etched to form a gate stack (gate structure). The etching gate electrode layer and the high-k dielectric layer may be performed in a plasma processing chamber. A source /drain regions adjacent to the gate stack may be formed. Spacers may be fabricated on the sidewalls of the gate stack. Thermal anneal may be performed on the gate stack.

Colombo teaches that a nitridation process may be performed on the sidewalls of gate structure (Fig. 4, [0011] [0012] [0026]). Unlike the claimed invention, Colombo is silent about using nitrogen-containing plasma for nitridating sidewalls. However,

Colombo teaches nitridation may be accomplished by any suitable techniques [0011]. Hence, it would have been obvious to one with ordinary skilled in the art to use the conventional nitridation method of applying plasma comprising nitrogen. Alers et al. (US 6,265,260; col. 3, lines 41-43) or Tu et al. (US 6,566,250; col.6, lines 7-9) is only relied on to show the conventional nitridation method of applying plasma comprising nitrogen. Because it is a conventional method in the art of semiconductor device fabrication and because it is disclosed by Alers, Tu, hence, it would have been obvious to one with ordinary skilled in the art to apply said nitridation method in the process of Colombo in order to efficiently carry out the nitridation process.

Since the combined prior art teaches performing same nitridation on the gate stack, it is expected that the method of the combined prior art would contain the same properties and effects (such as nitrogen forming an oxygen diffusion barrier in the high-k dielectric segment and preventing lateral diffusion of oxygen into the high-k dielectric segment).

Colombo (**[0012], last 4 lines)** also teaches that the nitridation of the sidewalls **may repair damage on the sidewalls of the high-k dielectric segment caused during the step of etching the gate electrode layer and the high-k dielectric layer,** which is same as instantly claimed.

Claims 21 and 28 differ from Colombo by specifying performing a nitridation process immediately after the step of etching the gate electrode layer and the high-k dielectric layer. However, Colombo discloses that the process steps in exemplary method in Fig. 4 may occur **in different orders, in addition, not all illustrated steps**

may be required to implement the methodology, see [0026]. Hence, it would have been obvious to one with ordinary skill in the art that the nitridation process may be performed immediately after the step of etching the gate electrode layer and the high-k dielectric layer as claimed in absence of unexpected result or criticality. Furthermore, in appellant's specification (page 8, lines 2-10), appellant states that nitridation can be performed in different process chamber, after wet clean process, or immediately after the gate etching. As such, there is no unexpected result or criticality that the nitridation process be required immediately after the step of etching.

In general, the transposition of process steps or the splitting of one step (e.g., etching step) into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. Ex parte Rubin 128 USPQ 440.
Changes in sequence of processing steps and the selection of any order of performing process steps are prima facie obvious in the absence of new or unexpected result. Ex parte Rubin, 128 USPQ 440. See also In re Burhans, 154 F.2d 690, 69 USPQ 330.

Claims differ from prior art by specifying performing the nitridation and etching in the same process chamber. However, it is common in the art that the plasma process chamber may be used for performing both etching and nitridation because it is efficient and more cost effective. See Chang et al. (2004/0188240; [0040]) or Ballance et al. (US 6,090,210; col. 1, lines 32-35), or Aronowitz et al. (US 6,759,337; col. 2, lines 45-50) or Chang et al. (US 2005/0019964; [0041]) as evidence.

The limitations of claims 21, 27, 28, and 34 have been addressed above and rejected for the same reasons, supra.

As to dependent claims 22-26 and 29-33, Colombo teaches various high-k dielectric materials, which read on instant claims, see [0025].

(10) Response to Argument

Appellants have argued that Colombo does not disclose performing a nitridation process immediately after the step of etching the gate electrode layer and the high-k dielectric layer. It is not persuasive. Colombo (**[0012], last 4 lines)** teaches that the nitridation of the sidewalls **may repair damage on the sidewalls of the high-k dielectric segment caused during the step of etching the gate electrode layer and the high-k dielectric layer,** which is same as instantly claimed. Colombo discloses that the process steps in exemplary method in Fig. 4 may occur **in different orders, in addition, not all illustrated steps may be required to implement the methodology**, see [0026]. Hence, it would have been obvious to one with ordinary skill in the art that the nitridation process may be performed immediately after the step of etching the gate electrode layer and the high-k dielectric layer as claimed in absence of unexpected result or criticality. Furthermore, in appellant's specification (page 8, lines 2-10), appellant states that nitridation can be performed in different process chamber, after wet clean process, or immediately after the gate etching. As such, there is no unexpected result or criticality that the nitridation process be required immediately after the step of etching. See also the case law cited above.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

BPAI, appeal 2007-0287, decided March 16, 2007. The rejection was affirmed.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Kin-Chan Chen/
Primary Examiner, Art Unit 1792
June 9, 2008

Conferees:

/Nadine G Norton/

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